

WHAT IS CLAIMED IS :

**1.A method of growing Gallium Nitride on silicon substrate,
including the following steps:**

5 **(a) providing silicon substrate whereon Gallium Nitride is grown,**

(b) removing oxide layer on silicon substrate,

(c) growing buffer layer of Silicon Carbon Nitride by supplying

gas mixture of H_2 , SiH_4 , NH_3 , and C_3H_8 , to reactor maintaining

at a specified growing pressure and temperature, during a

10 **specified length of growing time,**

(d) growing Gallium Nitride film upon the said buffer layer of

Silicon Carbon Nitride by providing source materials into

reactor maintaining at specified temperature, pressure, with a

specified rotating speed of substrate.

15 **2. A method of claim 1 wherein the said silicon substrate is**

oriented in $\langle 100 \rangle$ or $\langle 111 \rangle$ direction,

3. A method of claim 1 wherein the said silicon substrate is of

ither p-type or n-type , with specific resistivity of any value,

4. A method of claim 1 wherein, in the said step(b), the said oxide layer on the said silicon substrate is removed by Rapid Thermal Chemical Vapor Deposition system,

5 5. A method of claim 1 wherein, in the said step(b), the said oxide layer on the said silicon substrate is removed by Chemical Vapor Deposition system,

6. A method of claim 1 wherein the said C₃H₈ gas is substituted by CH₄, C₂H₄, or SiCH₄ gas,

10 7. A method of claim 1 wherein the said NH₃ gas is substituted by N₂,

8. A method of claim 1 wherein each flow rate of H₂, SiH₄, NH₃, and C₃H₈ gas depends on size of reactor and gas pipe design of the said gases,

15 9. A method of claim 1 wherein, in the said step(c), the said growing pressure ranges from 0.1mTorr to 40 Torr,

10. A method of claim 1 wherein, in the said step(c), the said

growing temperature ranges from 750°C, to 1500 C,

11. A method of claim 1 wherein The chemical composition of the
said buffer layer of Silicon Carbon Nitride ranges as: Si (1-x-y):

35-65 at.% , C (x) 0.1-25 at.% , N (y) 30-60 at.% ,

5 12. A method of claim 1 wherein, in the said step(c), the
thickness of the said buffer layer of Silicon Carbon Nitride
increases with growing time,

13. A method of claim 1 wherein, in the said step(c), the said
buffer layer of Silicon Carbon Nitride is grown by Rapid

10 Thermal Chemical Vapor Deposition system,

14. A method of claim 1 wherein, in the said step(c), the said
buffer layer of Silicon Carbon Nitride is grown by Chemical
Vapor Deposition system,

15 15. A method of claim 1 wherein, in the said step(d), the said
specified temperature ranges from 400°C to 1200°C,

16. A method of claim 1 wherein, in the said step(d), the said
sp cified pressure ranges from 50 Torr to 700Torr,

17. A method of claim 1 wherein, in the said step(d), the said specified rotating speed of substrate ranges from 10 rpm to 1000 rpm,

18. A method of claim 1 wherein, in the said step(d), Metalorganic Chemical Vapor Deposition is used to grow Gallium Nitride buffer layer in thickness of 100Å to 700Å at lower temperature, then form Gallium Nitride thin film in thickness of 0.3µm to 5.5µm at higher temperature.

19. A method of claim 18 wherein, lower temperature ranges from 400°C to 800°C, and higher temperature from 900°C to 1200°C, and both at pressure ranging from 50 Torr to 700 Torr,

20. A method of claim 1 wherein the said source materials include: N₂, H₂, SiH₄, NH₃, TMGa(TrimethylGallium), TEGa(TriethylGallium), TMAI(TrimethylAluminium), TMIIn(TrimethylIndium), and CP₂Mg(CycloPentadienyl Magnesium)

21. A method of claim 1 whereby the multiple-layered structure of Gallium Nitride / Silicon Carbon Nitride / Silicon substrate is

fabricat d.